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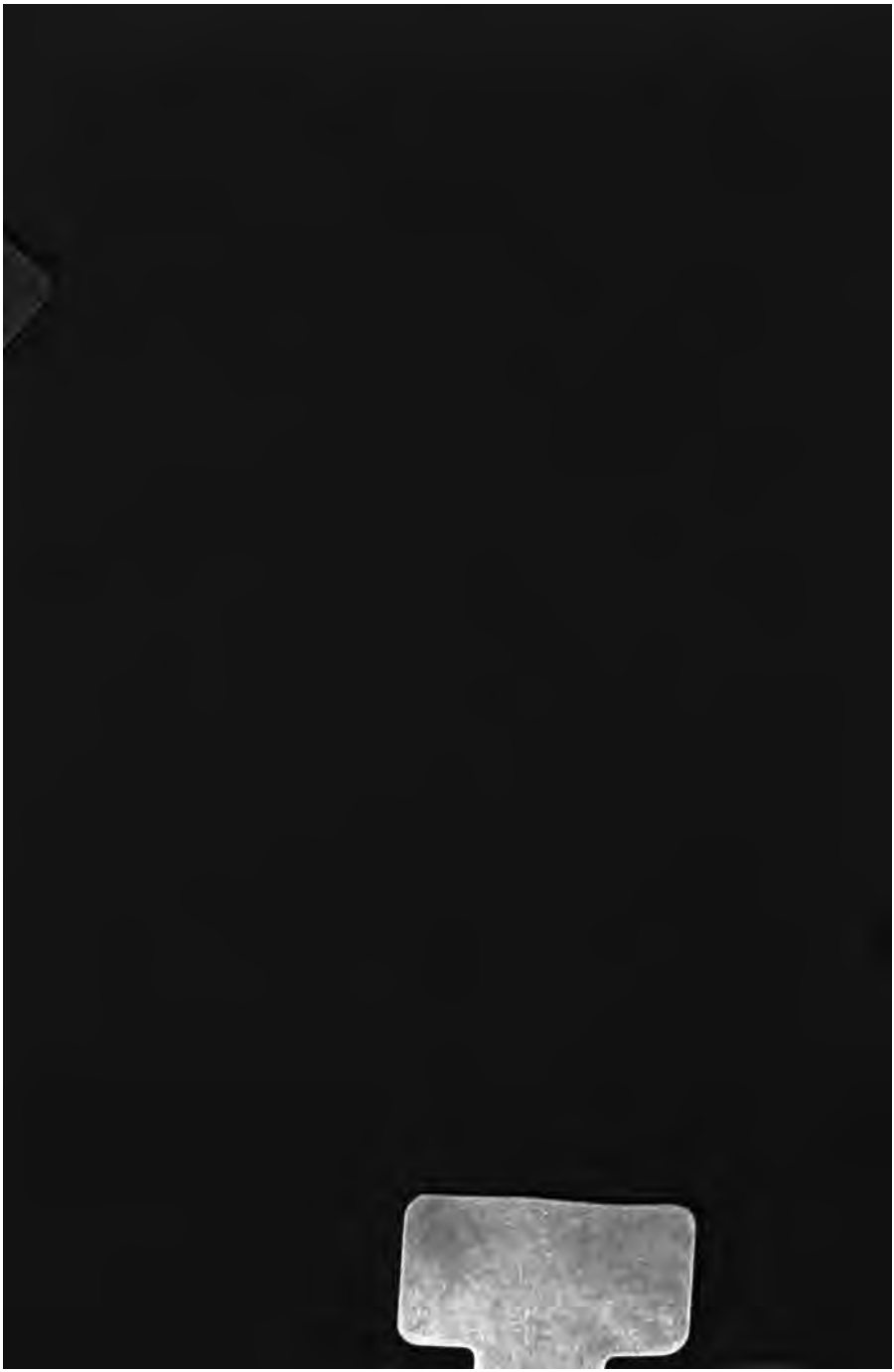
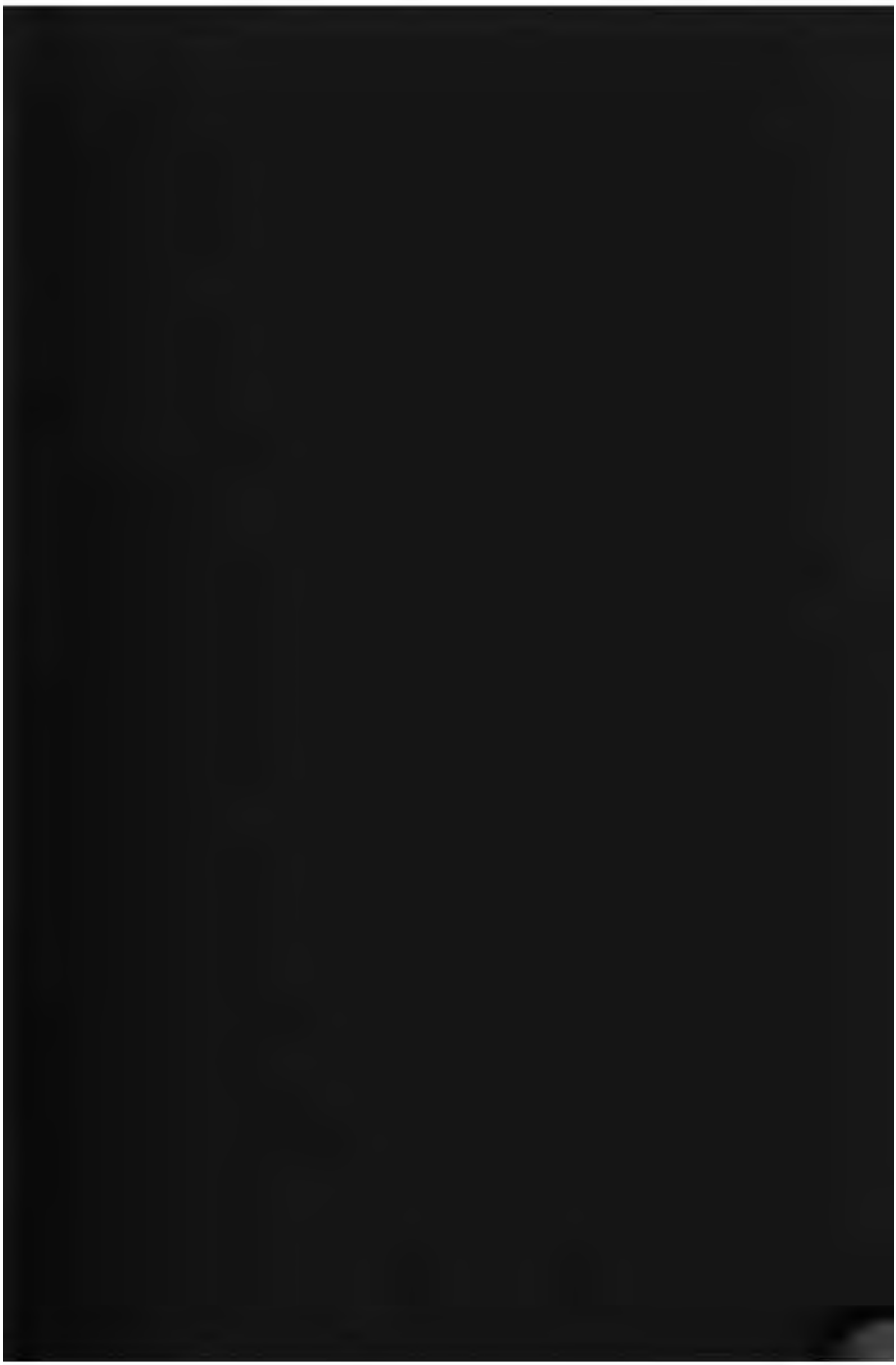
THE FUTURE OF INDIA





WATERWAYS OR RAILWAYS;

OR,

THE FUTURE OF INDIA.

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WHAT ARE WE TO DO WITH THE HUNDRED MILLIONS?

BY

LIEUT.-COL. F. TYRRELL, M.R.I.A.,

AUTHOR OF "PUBLIC WORKS," "REFORM IN INDIA," ETC., ETC.

FESTINA LENTE.

"Nunquam aliud natura, aliud sapientia dicit."—*Juvenal.*

LONDON:
EDWARD STANFORD, 6, 7, & 8, CHARING CROSS.

1874.

186. f. 49.

"Sir A. Cotton, a true man of genius—the greatest engineer that ever entered the public service in India—whose counsels would have saved millions of money and millions of lives, would have covered India with a net-work of navigable rivers and canals, pouring fertility over its plains, conveying its bulky goods to the coasts, and swelling the public income without taxation, at half the expense of a few lines of railway—utterly inefficient for the transport of produce, delusive as a military measure in time of war or insurrection, a perpetual burden on the revenues in time of peace."—Chapter ix, page 278, *Retrospects and Prospects of Indian Policy.* By Major Evans Bell.

PREFACE.

THERE are certain times in the progress of all countries, when an immediate and great change becomes necessary; and this not only political but physical. To apply this to India: it would seem that India is just now in a position to require a fundamental change in the conditions of the country, to prevent her retrogression, or perhaps her destruction.

To give an instance of my meaning. In 1845 I went down with my regiment from Nagpoor, through Raipoor and Sohnepoor to Boad in Orissa, where I was on detachment for nearly two years. From Nagpoor, nearly the whole way, the country was covered with dense jungle. At a place called Chicholie, the village was deserted, on account of the wild animals destroying the grain, and it was in-

fested with tigers. In 1864 there was, except near Sarkolee, Bhagnuddee, and Deoree, but very little jungle; in many places there was a difficulty about firewood. Many villages that I remembered hidden in jungle, I found standing in open ground, extending for miles in some directions.

Formerly the road was unhealthy, on account of fever (jungle), but it was not bad, as a rule, for cholera. Now cholera is hardly ever absent, from Raipoor *never*. I attribute this to the diminution of the rain-fall, due to the destruction of the forests and the consequent decrease of surface water. From Sarkolee, east of the Weingunga River to Raipoor, the level of well-water is very deep, the tanks spread over the country are mostly of large area, but very shallow; the best and finest tanks to the south-west of Sarkolee, on the east bank of the Weingunga, are, I regret to say in ruins.

This scarcity of water and the want of

moisture in the hot weather, to alleviate the rays of a vertical sun, are, I believe, the cause of the frightful mortality by cholera.

In 1864, passing along this road, the dead bodies were strewn all along it, and in some places ten or twelve were lying together, and jackals and hyenas preying upon them in the middle of the day. Nearly all the villages along the route were deserted.

In Berar, in 1854, there were very extensive babul plantations, in both east and west Berar; now there is hardly a stick to be cut. There are numerous other places where the same circumstances are occurring, particularly in the Madras Presidency, viz., a gradual decrease in forest land, and consequently a gradual diminution of rain-fall and a sinking of the level of well-water.

This has been caused by the gradual progress of events during the last two decades. Railways have been introduced, the value of wood has been greatly increased; both for

home purposes and for exportation, there has been an immense increase in the quantity used. The increase of wood by the conservancy department, has not and cannot keep pace with a destruction that is universal and ever increasing. The destruction of the jungle diminishes the rain-fall, and the diminution of water renders the ground sterile, these causes, I observe, have been in course of action for the last two decades.

The time has arrived, and I believe a most critical time for India, when a radical change is imperatively necessary in order to insure her prosperity and to prevent dire calamity.

Another solemn warning is now before our rulers. Another fatal famine is imminent. We have now to counterbalance the prejudicial tendency of events for the last twenty years, and to alter the physical conditions of large tracts. This can only be done by storing water: water alone can bring back fertility to the soil, and enable us to undertake successfully arboriculture.

I have, in the following pages, attempted to show that a due consideration of the physical nature of India would lead us to the true solution of her engineering wants, and that that consideration does not point to railways. With such honest, sincere, zealous men as Sir A. Cotton, Strachey, Dickens, Orr, etc., etc., how miserably we have failed to ward off the frightful destruction to life by famine, I need not dwell upon. I have, however, attempted to show the cause of that failure; and I trust that my mite may, in some measure, help the just and earnest consideration of the question, how to expend the 100,000,000 of money to the *best* and *real* interest of India, apart from all selfish interests, all engineering cliques, and all preconceived stereotyped ideas.

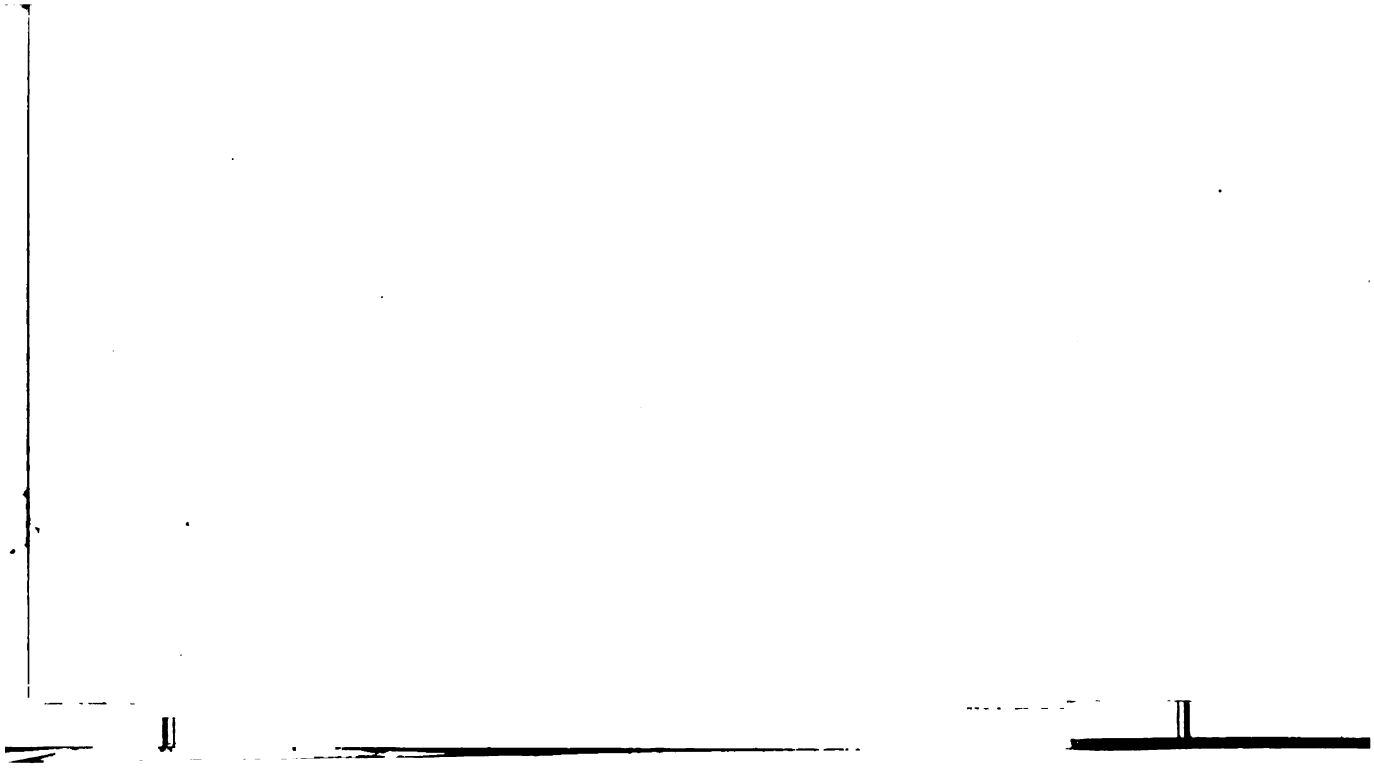
F. TYRRELL, Lt.-Col., M.R.I.A.

Foyle Park, Londonderry,
9th January, 1874.

PART I.

THE PHYSICAL ASPECT.

RESPICE, ASPICE, PROSPICE.



WATERWAYS OR RAILWAYS;

OR,

THE FUTURE OF INDIA.

In considering the wants of any country, with reference to engineering works, its modes of transit or system of agriculture, it is first of all necessary to pass under careful review the nature of the country, as regards its general formation, its mountain ranges, the course of its rivers, its soil, and then its climate.

Mr. Ellet,* in his remarkable work on the Mississippi, says, "It seems to be a rule in the natural economy, that countries remote from the ocean shall have outlets through great rivers of slow descent; rivers which serve primarily for their drainage, but so formed that they may be used in the progress

* Extract from "Notes on the River Navigations of North America," by Captain Haig, R.E.

of time for the highways of civilisation. The plains of China are thus supplied with the Amoor, and Russia with the Volga; Germany has the Danube, and Brazil and the states east of the Andes the Amazon, Orinoco, and La Plata; all rivers of gentle descent, leading far away into the interior, and all adjusted for navigation."

If we look at the vast continent of India, there are certain peculiarities that at once strike us. The main rivers run from the extreme west to the east, almost entirely across the whole breadth of the Peninsula; the descent is not always very gradual, but here I would trace that universal and beneficent adaptation of the forms of nature to our use, and readily discernible by those who patiently and earnestly study the works of God.

The rivers of India were not intended only for navigation, I may say they were primarily intended for irrigation: a further consideration of the subject will, I think, illustrate this.

Firstly, I would draw attention to the pe-

culiarities of the general contour and physical features of the Indian continent. This consideration can first be taken solely as regards the contours, the courses of the rivers, the directions of the mountain ranges, and the relative levels of its surface.

Then should be connected with the above the peculiarities of winds, temperature, rainfall, etc., etc.

After a clear conception of these main points, the more minute and intricate inquiry into the trade, traffic, and manufactures, wants and exigencies of the people has to be entered upon; and when these have been mastered, we are in a condition to suggest the proper engineering works suited to the general conditions of the country.

In the space I propose to allow myself, I can but glance at these general conditions, and leave to others the filling in of more minute detail. As I have said before, the general fall of the continent of India is from west to east right across the country.

We have five large main valleys, the drain-

age of which falls into the Bay of Bengal—that of the Ganges, that of the Mahanuddy, those of the Godavery, and Kistna, and the Coleroon. The Ganges rises in the Himalayan ranges, the Mahanuddy in central India, the Godavery, and Kistna, and Coleroon in the western Ghauts.

The distance of the sources of the three last-named rivers, or their tributaries, are scarcely more than fifty miles (as the crow flies) from the western coast, while in the parallel of Coringa, the east coast is distant nearly six hundred miles (as the crow flies) from the ridge of the western Ghauts.

We have a peculiar depression across central India—a line could be drawn from Cuttack through Raipoor, Nagpoor, and down the valley of the Poorna, by the Taptee, to Bombay, that should nowhere hardly rise above nine hundred feet. The Taptee, Nerbudda, and the Indus are the three great rivers that drain the valleys falling to the westward (see map).

North of the most southern large rivers,

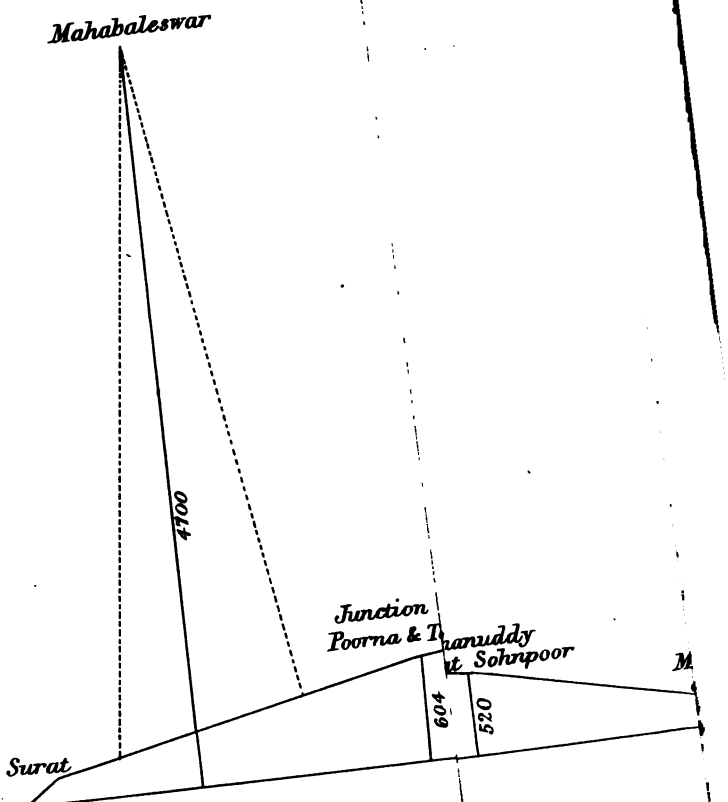
the Cauvery and Coleroon, we come to the table land of Mysore; the southern face of this elevation is rather abrupt. The Tapoor, Moroor, and Munjawaddy passes lead to the south. To the north the land falls more gradually towards the Pennair and Toongabudra. There is generally a fall from the tableland of Mysore to the valley of Toongabudra, and on to the Godavery; taking the average of the tableland at 2500 feet above the sea, Bellary is 1600, and the Godavery above Neermul would be 800.

The Toongabudra, in the Bellary district, presents a curious feature at Humpy; it passes through (it may be said) the Ramandroog hills; probably at no very distant date (geologically speaking) the country to the westward of the Ramandroog range was a vast lake before the river burst its way through. From the old native annicut below Humpee to Camlapoor (about twenty miles), there is a fall of three hundred feet; the river rushes through and between hills formed of huge boulders of granite, and the

bed is strewn with mighty rocks, amongst which the stream foams and frets, and which can only be threaded by the curious round wicker boats covered with buffalo hide.

The hills on each side of this river formed of these huge boulders of granite have but little earth in them; passages can be found quite through the hills, running into large irregular caverns, and in spite of leopards and bears, I spent one whole day in the bowels of a mountain near Humpee. To the northward, through the Hullee-Koomut jungles, swarming with tigers, the same description of hills are met with; and eastward at Bellary are several isolated hills of the same description.

The Ramandroog hills, three thousand feet high, run north and south, and are very steep; they offer a serious obstacle to the formation of a canal parallel to the river on the south bank. A canal taken off high up, above Hurrhyhur, might find a passage on the north bank. A fine canal might, however, be taken off below Humpee to irrigate the Bellary dis-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trict as proposed by me in 1856. This could be connected with the irrigation from the Huggry.

From Bellary, towards the north, you pass over very extensive plains and some high ground to Hyderabad, but no high ranges; following the route by Beeder to Jauluah, you pass over generally level country, where vast uncultivated tracts present themselves, only requiring water to be most fertile. The route to Nagpoor, *viâ* Neermul, is more hilly, but there are no lofty ranges.

There is generally, as before observed, a fall from the Western Ghauts to the east coast. The fall immediately to the eastward of the range is sudden; but from Hurrhyhur the slope is gradual (see section). Hurrhyhur is about 1888 feet above the sea, Bellary 1600; Gooty, further east again, 1260, whence you can obtain a general fall along the course of the Pennair. Again, farther north, we come to the low line across the peninsula above mentioned, by Nagpoor and the vallies of the Poorna and Taptee. Here a canal is

quite practicable, which would open up the very heart of India, passing through the best cotton growing country, and near to the Nagpoor coal fields; it would penetrate one of the most fertile districts in the whole of India. The wheat of Seuni and Jubbulpoor, the coffee of the Shervaroy Hills, the cotton of Nagpoor, and the cotton and linseed of the Berars would all pass down this way. There is also coal and iron to be found in Woon; and from being the country most infested* with tigers, it might become a great central manufactory for iron.

The adaptation of the natural features of the country to the wants of the human race is most remarkable. Let those who foolishly and for interested motives venture to strive against these natural facilities, pause and consider the weight that is due to such configuration: not only are the levels suitable for a canal, but there are sites in the lower ranges of hills under the Chickuldahs most favourable for the storage of water: twelve

* I speak of the year 1862.

miles west of Ellichpoor beyond Borgaon there are low hills running parallel with the high range enclosing valleys; these hills are only broken by narrow outlets, through which streams flow—a few hundred yards only of embankment would be necessary to form very extensive lakes: also immediately to the north and north-east of Ellichpoor favourable sites are numerous.

There is another part of India, where the west and east can be joined by a canal, that is by the junction of the Jumna and the Sutlej: this has, I believe, already been commenced.

The Wurda can be joined to the Taptee by a canal down the valley of the Poorna, or the Weingunga could be led to the Wurda across Nagpoor.

To the south of the Poorna valley, there is a range of hills that excludes the possibility of a canal going south in that direction, but we have at the head of the Poorna valley itself, a most simple means of connection between the southern rivers running to the eastward

and the two rivers Taptee and Nerbudda running to the westward. The Wurda takes its rise in Central India, west of Baitool, and flows south from the Chickuldah Hills between Woon and Chandah, where it falls into the Peingunga, these rivers are joined further east by the Weingunga, whence under the name of the Prenheeta they flow to the Godavery.

I might here say a word on the Godavery navigation. Colonel Chesney remarks, that the climate is most unhealthy; I differ from him, nor is the country nearly so unhealthy as supposed. There is nothing but the want of funds to prevent the opening up of one of the finest lines of navigation in the world.

There was, however, doubtless at first starting a painful misconception of the scope of the enterpise, and a fundamental mistake made in trying to obtain a free passage along the river itself.

The area drained by the confluents and Godavery proper, may be roughly stated at 600 miles by 400 miles, 240,000 square miles.

The formation of canals round the barriers is without doubt the proper way to surmount those obstacles. The level of these canals will require most careful consideration; that level must depend greatly on the head of water it is intended to keep back by the barriers. These natural barriers might be greatly increased. We require, however, to take a comprehensive view of the whole drainage in order to arrive at any satisfactory result or scheme for a system of works, that shall modify the dangerous currents in floods, and shall account for vast volumes of water. To do this we must attack the sources of our large rivers which nature has pointed out as the proper site for reservoirs.

The project is difficult but not insurmountable. What we have to do is to store water, and make use of the millions of cubic yards of water, which at times rush destructively over the country. The Godavery navigation, I repeat, is a difficult undertaking on account of the vast volumes of water to be contended with, but we shall not

improve matters by looking at it piecemeal, we must take *the whole drainage system* and master it.

This hitherto has been impossible, as the funds for irrigation or water works generally have been so paltry.

If it should please Providence to instil into our rulers the same zeal for India, that they have shown for Manchester, if they should imbibe the necessity there is for water, as readily as they have jumped at the conclusion that railways are the *summum bonum*: and would they allow the eight millions expended per annum on railways to be profitably invested in canal navigation and irrigation, the men will be found to carry out and conquer all difficulties, and instead of a dread of a yearly financial collapse, we should place our financial and political position on an honest and secure footing.

Let us now proceed and consider the country towards the north.

Above Nagpoor we rise rapidly to Jubbulpoor. Beyond Nagpoor we come also to the

first river of any size, that runs to the eastward, the Taptee, and north again, the Nerbudda. Both these rivers have yet to give a far greater quota of water for irrigation.

From Jubbulpoor to Rewah the country is open and pretty level, thence to Mirzapoor there is a very rapid fall, and we arrive at the great valley of the Ganges and Jumna.

The whole of this vast region is particularly level: from the Sonderbonds to Delhi and to close below the hills, there stretches one vast plain, traversed by large rivers, that have their sources in the Himalayas or in the highlands of Central India.

Underneath the Himalayas there is a subsidiary tract of low hills, where in my opinion, most favourable sites for the storage of water could be obtained. In many parts along this region, there are immense jheels and unhealthy jungles that require to be cleared and utilized. There is here a vast field for our activity, if we can but withdraw our fascinated attention from the present mania for railways. At present these regions act solely as a sort of

preserve for sportsmen. In Captain Baird Smith's book, in the appendix on Indian irrigation, he refers to the shingle formation underneath the Himalaya range. I shall refer to the importance of their formation, when I come to speak of irrigation works.

Again on the far west in the Punjab, we have five rivers running through an arid soil and joining in the Indus, passing by Kurrachee to the sea. It has been calculated that twenty millions of acres could be cultivated here. A vast field of labour presents itself here for our hydraulic engineers. Hitherto we have not succeeded well in our navigation canals. Two points are to be observed: that a small fall per mile is absolutely necessary for traffic both ways, and that a river's main course is not suited for the passage of traffic. Indian rivers often deviate from their old beds, are full of shoals and sandbanks in the hot weather; are generally very tortuous; and the velocity of the stream is against imports. These remarks apply to nearly all our Indian streams. Irrigation has been commenced on

these rivers since the middle of the fourteenth century, and we have done somewhat since, but a wretched amount of work in comparison with the importance of the subject and the wants of the country. I would here also remark, from the considerations above mentioned, that navigation canals should be kept separate from those of irrigation. Our large rivers and the irrigation canals might form a useful highway during the wet season to transport goods downwards, and for local traffic; but for upward traffic, canals are required with a small fall, both on account of the current and also for economy in the use of water, and deep, to prevent the growth of weeds. The heavy traffic during the rains might pass down some of the irrigation canals and rivers at great speed, in the round native wicker boats twenty feet diameter, covered with buffalo or camel hide; and if these rivers or irrigation canals were joined at intervals or where practicable with navigation canals, these boats might be conveyed perhaps to the seaboard, where they would be taken to pieces, the hides packed

up and returned by steam canal boats up the navigable canals, to be reconstructed for another season.

These boats are capable of taking considerable cargoes, are comparatively very cheap, are almost incapable of being upset, and stand bumping on rocks in a wonderfully elastic manner.

I have attempted to give a slight sketch of the general aspect of the Indian continent. What I have described I have seen. From Madura and the Rock of Trichinopoly in the south to the Terai and Missouri to the north, and beyond into the Himalaya range ; through Bangalore, Hyderabad and Nagpoor and Jubbulpoor, I have travelled nearly all on foot. From Nagpoor through Chuttesghur, Raipoor, Sohnepoor, to Goomsur and to Ganjam, I levelled over the whole of the Bellary district in reporting on a canal to join the Toongabudra and Pennair rivers.

Over the Chilka lake, through the unexplored jungles of Boad and Balasye, I have passed in every direction ; from Cocanada to

Madras: from Madras to Vaniembady, thence twenty miles beyond Salem I levelled for the Madras railway; from Nagpoor again through Berar down the western Ghauts, I am intimately acquainted with the nature of the country. I can therefore speak with some authority as regards the practicability of what I urge.

We will now consider what bearing the climate, winds, and rainfall, and the configuration of the country, have upon her engineering requirements. We have in India three seasons: the hot, from the middle of February to June, rains from June to October, the cold weather from October to February.

From May to October we have the south-west monsoon, which brings a rainfall of from 50 to 300 inches: from October to April the north-east, from 30 to 60 inches. I need not dwell on the scorching heat of the dry months, or the downpour during the rains, nor stop to point out the unhealthiness caused by want of proper drainage in such a hot climate; or the desolation caused by want of irrigation of the

scorched up plains. I would point out the beneficent arrangement, that causes the western ranges to stop in a considerable measure the monsoon clouds, and prevents them being blown over the burning continent of India, at the same time that it causes them to give up their fertilizing water at the sources of our great rivers. These waters become, by passing down the mountains, surcharged with earth, and are accumulated on the very place whence they can be led with the greatest advantage over the country for irrigation. On the western Ghauts from 150 to 300 inches fall per annum: to the eastward of the western Ghauts nowhere hardly more than 50. Mark! how we have neglected this manifest and providential arrangement: we have formed annicuts in the Delta and led off channels from the lower portions of rivers; but on the high levels where the land can best be irrigated and water stored, we have done but little; and yet how apparent must it be to the simplest mind. We might moreover store as much water as we could *possibly* use, and yet leave sufficient for the lower works.

The north-east monsoon brings a far less amount of water, but there are no high mountain ranges to stop its progress over the land, so that its waters are carried comparatively further into the interior. Yet there are many sites where tanks might be formed to preserve some of its water. On the west coast again, further north, where the great western range sinks, and the rivers Taptee and Nerbudda debouch into the gulf of Cambay, the south-western monsoon is borne further inland, and a greater volume of water is poured on the higher tableland of Central India, whence rivers rise that flow to the north, the south, the east and the west. The south-west monsoon seems to pass rapidly over the low lying lands of the Indus and to be attracted by the mountain ranges ; thus in all cases it is the sources of the rivers, that chiefly benefit by its water. Another great source of water supply is by the melting of the snow on the Himalayas,—a most timely supply, as it occurs during the hottest season.

Taking the lengths of the western Ghauts at

750 miles from Cochin say to Surat, and the width of the eastern slopes of these mountains at 20 miles and the average rainfall at 120 inches, we should have from these slopes of the mountains alone about 154,725 millions of cubic yards of water;—or taking the whole country to the east of the western mountains between the same lines of latitude to be 300,000 square miles over all, this would give sufficient water alone to cover the whole to a depth of six inches, which added to the average rainfall of 36 inches would raise it to 42 inches per annum over all, or 3,252,480 millions of cubic yards, sufficient to irrigate 800 millions of acres.

For this area of 300,000 square miles, if we allow 200 acres as under wet cultivation for each square mile, it would only give us 60 millions of acres to be irrigated.

Thus we see, that India is plentifully supplied with water, nay, I have shown, that water is in the most profuse abundance, yet since 1833, above ten millions of people have died of famine for the want of that very element, and

because we have neglected to erect the works necessary to store and preserve it,—works which, if properly carried out on a sufficient scale, should be a safeguard against famine, against malignant fevers, and against many dangers attending the navigation of some of our principal rivers—and afford a constant supply for irrigation and navigation. I think also that the cost of keeping a navigable canal free from weed and silt would not come within 50 per cent. of the cost of the maintenance of the permanent railway. A dredge stationed at certain intervals to drag the weeds, and remove the silt, would not be expensive.

To give some idea of the quantity of water we can calculate upon, and the difficulties of contending with it, I will shortly describe the rainfall and its effects in the valley of the Poorna. I consider this portion of the country as claiming our particular attention, as through this valley the connection can be made into the very centre of the Peninsula, by joining the eastern and western waters, and

this portion of India can lay claim to the greatest fertility, and will, I think, be found the richest in mineral wealth.

There is coal and iron in Woon, gold in the Wein Gunga, and to the eastward; iron in Boad, and I imagine the wild tracts beyond Raipoor would be found rich in minerals. Diamonds are found in the Mahanuddy near Sohnepoor, and there is good slate near the Burmool pass in Boad.

By this route not only the Godavery, but the Mahanuddy could be joined to the Taptee, through the valley of the Poorna.

The valley of the Poorna may be estimated at the outside at 8000 square miles, call it 5,000,000 acres; the rainfall is about 42 inches on the average, taking the fall on the hills and on the plains—now 42 inches on 5,000,000 acres + 43,560 square feet = 217,800,000,000 + $3\frac{1}{2}$ = 762,300 millions cubic feet of water: allowing $\frac{1}{4}$ to be lost by absorption and evaporation, we have 571,800 millions cubic feet to account for. Allowing that this rainfall takes place between the 1st of June and the

1st October, or during 120 days, it would give 4765 millions of cubic feet to discharge daily. Supposing that this amount of water had to be discharged by one river like the Wurda, which discharges about 25,000 cubic feet per second, it would, I say, take such a river about two days to discharge; but the number of the streams running from the northern hills and the southern hills into the Poorna, which flows down the centre of the Berar valley, greatly exceeds in the aggregate the discharge of two rivers the size of the Wurda. This then is not the *difficulty* we have to meet. In this particular case there are two difficulties; one is, that in extraordinary falls of rain the confluents of the Poorna are not able to discharge the sudden downpour; but as all these rivers rise in hills a short distance from the Poorna, and flow into that river at right angles by courses short and with a very heavy fall, the Poorna is totally unable to discharge the water so rapidly brought to it, and is in consequence subject to extremely heavy floods, extending sometimes above a mile on each bank. Ac-

cording to my calculation above, there would be about one-third of an inch per day for the hundred and twenty days; but I have myself known two inches to fall in twenty-four hours. This would give us six times the amount of water to be dealt with. Now supposing that the rivers, etc., were just capable of discharging one inch of rain in the twenty-four hours, we have to account for one inch, or 14,295,000,000 of cubic feet of water to dispose of.

Captain Fyfe estimated two tanks in the Bombay Presidency to contain 120,000,000 of cubic yards of water each, and a reservoir was calculated for Hyderabad to contain 1,600,000,000 of cubic yards, or three times as much water as we have here to deal with. These reservoirs, however, sink into insignificance at the mention of the Ponairy tank, with an area of seventy square miles (now in ruins), or the Veraunun tank, thirty-five miles in area. There are many excellent sites along the north of the Poorna valley, were water might be stored, and a canal would

always form a relief for the discharge of the water by the Poorna. The formation of reservoirs would also cause vast volumes of water to be absorbed by the shingle stratum which exists under the hills on each side of the valley.

I have entered somewhat into detail on this point, as I wish to show the nature of the difficulties to be contended against. I have taken the Poorna valley, as I was engineer officer there for nine years, and I know of no more difficult tract of country in which to provide for the proper regulation of the water. This arises from the basin-like formation of the valley; the high ranges on each side, the short and extremely steep course of the rivers on each side flowing at right angles into the Poorna; these present peculiar difficulties. I have, however, rather overstated than understated the difficulties. The soil is black cotton soil, and extremely absorbent. There is also on both sides of the valley a shingle bed, as mentioned by Captain Baird Smith, as occurring under the Himalayas,

and below this columnar basalt with vertical fissures. I might therefore take the absorption and evaporation at a half rather than a quarter of the rainfall. I have said enough, however, to show the nature of the difficulties, or the immense volumes of water that we can have at command.

I trust to show the reasons why we have not, and would point to what was done by Colonel Dixon, in Mairwarra (mentioned further on), in order to show what a little brain-work can effect; and would draw particular attention to the fact that vast improvements may often be made more advantageously by small local works, than by extensive imperial schemes, and so quick returns for outlay can be secured.

The absorption of the shingle formation would alone account for immense volumes of water; as Captain Baird Smith states, the wells in the shingle bed rose sixty feet; and taking the length at a hundred miles, and breadth at eighty, and mean depth at thirty feet, we should have 495,610,000,000 cubic

yards of earth or shingle saturated with water; and suppose a cubic yard to contain one-twentieth part of water, we have 24,780 millions of cubic yards stored in a most advantageous manner, being protected greatly from evaporation. Again, the extreme rain-fall at one season, and the extreme heat at another time, cause the maintenance of a road to be a very difficult matter; more particularly in many parts of India. Where the vast cotton soil plains exist, it is most difficult to cross them by any road, unless of the most expensive description. Canals on the contrary could always be kept in order, and they would also allow of the planting of trees along their course, which would have the two-fold effect of lessening the evaporation, and rendering the rain-fall more abundant.

This would be a very important consideration as, I think, there cannot be a doubt that in many parts of India the rain-fall has decreased, and cholera become much more prevalent, on account of the clearing out of vast

tracts of jungle. The formation of canals would enable us to plant useful tress in the place of the usual jungle, which might also become a considerable source of revenue. This has already been carried out on a small scale.

Let us now consider the nature of the produce, and what manufactures are to be found, and what are the most general occupations of the inhabitants. Here we can be at no loss for an answer. There were formerly, it may be said, but two classes in India—the consumers of food and the producers of food. The rajahs and courtiers, the Brahmins or religious sects, the chethrias or soldiers formed the one class—all were provided for by the ryot. There were many trades, but no large manufactures—the ryot produced the food and revenue. There were a few weavers, goldsmiths, etc., who supplied the necessary goods, but the exports, except in raw produce, were never large. The only trades of any extent were in coarse cloths, brass vessels, and oil pressing; rice, spices, grains generally, were

her main produce. In fact, the face of the country proves that agriculture was the chief occupation of the natives — its history is stamped on the country in 90,000 tanks, 30,000 of which are in ruins, besides the old system of canals in the north-west. These, however, only date back from the middle of the fourteenth century. The tanks in Boad and the jungles south of Raipoor, would date four hundred years before Christ, or even earlier.

Things are not much altered now; there is a commencement in mining and in iron manufactories; but some part of the 100,000,000 should doubtless be expended in promoting native manufactures on a large scale.

Seeing then the people are agricultural, that the great want of the country is a certain supply of water, that all produce is of great bulk for its weight, that the natural habits of the people are of a quiet domestic kind, not given to travel—what do we do? We give them 5000 miles of railway. These railways have cost 93,000,000, and at the present time

add 3,500,000 to our taxation. They carry goods at 1½d. a ton per mile, not counting the price paid by extra taxation, and the amount carried is totally insignificant — 11,000,000 tons on all the railways, or on the average 56,000 tons per mile. From this 93,000,000, 30,000,000 have been expended for stores, etc., in Europe.

India had to pay £1,582,900 in 1872 to shareholders, and this loss is still going on, and according to the last official report, "Blue Book (c643), 1871-2, the loss is likely to increase, as there has been a serious falling-off in receipts. Our additions to the present railway system, we must remember, are not likely to add to their income.

Sir A. Cotton justly remarked before the East India Association, "my very object on writing on the subject is to show the ingenious fallacies in the argument used by the railway advocates—that adding unproductive pieces of railway to highly productive parts will increase the average of the whole."

I need not go through all the figures that

have been placed before the public *ad nauseam.* The "Blue Book" above referred to gives those figures; but the Blue Book does not and cannot explain to the British public the disastrous loss that those railways have been to India, nor on what a precarious footing it has placed her financial credit. Great things were estimated for these railways — great things were prophesied regarding them—these have not been verified. They have been tried and found wanting, and they have failed, I believe, because they are not in accordance with the natural wants of the country; and the country neither in its progress nor development was prepared for them.

How few people have thought on the power of caste. An agricultural people, who for centuries have had but one employment, never broken, never varied — century by century, year by year—working the same fields, and using the same wells, or dying out by famine or by war, but never willingly moving from their village and their land,—to these people we send a railway, when we should have brought them water.

On the 14th of December, 1869, Major Evans Bell, in the discussion on Sir A. Cotton's paper before the East India Association, justly remarks, "that railways are not appreciated in India, as not one per cent. of the capital is subscribed by natives." It is a fact, that railways are not thoroughly appreciated, and the reason is, because they are not adapted to the country. Mr. Hyde Clarke remarked, "that we find the whole of Europe, and the whole of America at this moment adopting not only canals, but railways and roads as a means of improving the transit of the country, and why should not India do the same?" The answer is manifest. Because India differs most essentially in many important points from Europe and America. Sir A. Cotton's statements may be called exaggerated; they may be the assertions of an enthusiast; but they are the utterance of genius. He has been able to break through the gregarian idea of railways, and with a true instinct has ever declared the paramount necessity for water in India, both for irrigation and navigation.

PART II.

OUR SINS AND OMISSIONS

IN

1. STORAGE OF WATER.
2. WORKING OF COAL.
3. WORKING OF IRON.

"The rising deluge is not stopped with dams,
But wisely managed, its divided strength
Is sluiced in channels, and securely drained,
And while its force is spent and unsupplied,
The residue with mounds may be restrained."

Shakspeare.

PART II.

I HAVE before observed, in my "Public Works Reform in India," that history also teaches us the paramount necessity for water; the instincts of the natives have plainly written in 90,000 tanks, what are the wants of the country. Since our arrival a century ago, up to the present time, we have neglected to repair 30,000 tanks. Such is the force of training, and preconceived ideas. There has not been a man, with the exception of Sir A. Cotton,* who has been able to free himself from the European stereotyped groove, to entertain the true idea of the wants of India, from an impartial consideration of her physical peculiarities.

These points, I have attempted to show, are due to her configuration, to her climate, and her rain-fall, and are also indicated by the general class of her productions, and the

* Colonel Strachey has now become a champion to the cause. With such a leader, and the present dire calamity before our eyes, we may at last enter into a really satisfactory system of engineering for India.

natural proclivities of her populations. Sir A. Cotton knows and can appreciate these peculiarities, and is well aware that the life blood of India is water. The grand prevailing railway mania having swept over Europe, was transported by English engineers and English iron-masters to India.

India was not ready for railways; it was, to use the apt simile of Sir A. Cotton, like giving a beggar a carriage to ride in. Why was she not ready? Because she had no roads to act as feeders; because the agriculture of the country had not been developed; because her manufactures had not been commenced, most ostensibly her iron manufactures. Moreover, I insist that railways were not *primarily* the proper mode of carriage adapted to the country. The railway was simply the result of a vast European scientific movement, that enthralled men's minds at the time, and was carried by our scientific men into a far distant country, where without considering the vast differences on all main points, the *prevailing idea* of the age, and *the interests of their own countrymen*, carried the day.

We have, however, disinterested men at the head of affairs, and I trust, what I have written may cause those in authority to pause before they burden India with more railways; before they add more difficulties to our financial position. I do not say that railways have done no good, nor that no more railways will be necessary, but what I say is, that we are bound to supply all the countries of India with an ample supply of cheap food; to store as much as we can of that immense supply of water, that Providence pours on the thirsty land at stated intervals; that we should improve the country by storing that water, so that, as Sir A. Cotton says in the discussion above referred to, "navigable canals can be combined with irrigation and drainage, and so become the means of averting those famines which devastate the country from time to time, and of carrying off the superfluous water, and removing the cause of those terribly malignant fevers, which have ravaged the country, and are doing so now."

As Capt. Smith in his book on Italian irrigation before referred to says, "the water level

of the wells under the Jumna canal was raised 60 feet"—how important must this be: and how vast a change does it point out as being capable of being made over immense areas; had proper reservoirs been made in the hill's ranges, north of Bengal, it would materially affect the whole country—and the present distress would have been prevented. The shingle formation under the Himalayas, I have before observed is most important. The water level would be raised generally in the shingle beds under the hills, if reservoirs were made in suitable sites—and this immense amount of water would be drained away by being drawn off to feed canals, on a lower level and again and again refilled through the reservoirs. The water would pass, as it were, through an immense filter; it would carry off and absorb much deleterious matter and render the country far more healthy.

This is a very important point for careful investigation. It has been for some time the opinion of scientific men, that cholera and fevers generally are caused by *infusoria*. The fact has been long known, that moisture has a

destructive effect on these *infusoria*. Rotifera will preserve the property of reviving up to 159 deg. Fahr. in dry sand, but lose it in 121 deg. in moist sand—(Doyère, *op. cit.* p. 119). The fact again that cholera seems to be propagated in the tank districts, and generally to be worst in those provinces, I consider as advanced without suffient proof; but I believe cholera to be propagated and to be generally worst in a dry country, where the water level is extremely low, as in Raipoor, where there is little irrigation, and water is derived almost entirely from small tanks, that mostly dry up in the hot weather. There, irrigation on an extensive scale might have a most beneficial effect.

Dudabhai Naroji naïvely remarks in the discussion before the East India Association, "one great merit of the railway is the great speed with which it can relieve famine stricken districts." I think it would be better first to secure the districts against famine. It can be done; nature has not been niggardly of her water. There is abundance for all purposes,

Mr. Juland Danvers also remarks, in the discussion regarding the expenditure of one hundred millions for railways, "I do not think we should hesitate for a moment to support a policy, which will by degrees introduce through the length and breadth of the land a system of communication, that will bring benefit to all, and injury to none." Nothing can be more fallacious in fact, or erroneous in principle. How a benefit to all? when at the present time 10,000,000 are threatened with famine? do you say £100,000,000 spent on railways is a benefit to all, when the history of the country and the exigencies of her climate demand water to be stored? How again do I ask, is it a benefit to all and an injury to none? Is it no injury to saddle the country with 3,000,000 of annual debt, and to allow hundreds of thousands to die of famine from want of water, and to be destroyed by malignant fevers; evils that a proper system of water storage and drainage would remove? Is it no injury, that that sum would go to swell our deficit—and saddle the country

with an expensive system of communication, when the same sum, expended doubtless with much more labour of brain, and with less *éclat*, on water supply and canals, would raise the country from a *false, entirely false* financial position, and enable her to divest herself of the dishonest gain from opium,* and relieve herself from the odium of raising her heaviest tax from the first want of man, salt. No injury!! So speaks one, who has doubtless much authority; it only shows, how we may err, when we trust exclusively to European brains and ideas: when we neglect and despise the native ideas and intellects.

It markedly points out, into how great errors men are led, when, trained and educated in one country, and one class of surroundings, they arrogantly set themselves to prescribe and dictate for the wants of a far off and wholly differently circumstanced country, which country probably they never saw, and only know of from men who are very superficially acquainted with the subject,—men who

* One-fifth of the revenue.

from habit and circumstances are unable to divest themselves of the prevailing current opinions, and from want of opportunity, cannot grasp or comprehend the wants of a tropical country. I would suggest as a remedy, that the Indian council, which is mostly composed of men with great Indian experience, should be initiative, and that their deliberations on the affairs of India should be publicly reported. To be of any real service that council should be in India, and should be largely assisted by native talent. It would save India much, in stopping undigested schemes, and prevent her pocket being picked for imperial European exigencies by British statesmen: 10,000,000 or 12,000,000 a year paid to Great Britain, is draining the vitality from the country; but this will not be stopped, until the Indian purse strings are held by a living India council in India, subject to public opinion and criticism.

Again, Mr. Danvers asks at page 119 of the discussion about expenditure of 100,000,000 on railways, "How many millions of tons of

cotton were taken across the Ghauts down to Bombay during that period? . . . How could a canal have been taken from Bombay into the Deccan?"

I answer—If the same mania had existed for canals as existed for railways—very easily—much more cheaply, and a canal would have been more effective; whereas hundreds of tons of cotton rotted at Akola and Kurrusgaon, because the railway could not carry it, a canal would have carried all. I speak from nine years intimate acquaintance with the district, and I say that a canal could be taken from the Weingunga beyond Nagpoor, or from the Wurda along the course of the Poorna and Taptee to Bombay.

Let me now shortly show what can be done by water, and how, in the most unpromising countries, a small outlay will, under careful management, produce the most beneficial results.

The excellent description of Colonel Dixon's work in Mairwarra, will well illustrate what I mean; it is found in Captain Baird Smith's appendix to "Italian Irrigation," page 407.

The account is too long to quote at length. I will, however, give some extracts; but I would refer my readers to the book itself, it is well worth perusal.

Captain Baird Smith writes, "Colonel Hall, during his administration of Mairwara, made or re-established seven tank embankments. The benefit to the people, and the returns of revenue to Government had been great, whilst the outlay was very trifling. But the plans of Colonel Dixon for the improvement of the country, and indeed their object—the placing the whole district in a position to withstand a season of drought—required a rate of progress and extent of measures, with which the previous work would bear no comparison.

"Such a system could not be carried out without the sanction and the ample aid of Government; but this sanction was accorded. . . . The objects aimed at were: 1st. The insuring a sufficient supply of water for the permanent cultivation of the soil. 2nd. The subjugation to the plough, of tracts then abandoned to the jungle. 3rd. The conver-

sion of every individual inhabitant into a cultivator. . . The principal means to the attainment of these objects were the formation of large reservoirs of water, by damming up the main watercourses of the country.

"Such reservoirs (tulaos or tank embankments) would supply irrigation to the lands below them, through sluices and higher levels by the usual rustic machinery, the wheel or bucket; their beds on the withdrawal of the water would afford luxuriant cultivation, requiring neither manure nor further irrigation, and *percolation from the tanks would supply numerous wells in rear of the embankment*, by means of which land might be brought into cultivation, which was much beyond the influence of the sluices."

At page 409, he describes a series of dykes built across the small valleys in more hilly ground, to obstruct the passage of the rain-water, so that it shall be absorbed by the soil. At page 420, speaking of tanks, he says, "by a series of such works, a continuous canal, as it were, is maintained from tank to tank along the

hollows, serving to supply numerous wells besides its banks. In this manner, by a system of tanks connected by successive weirs, a sheet of cultivation of varying breadth, has been carried in one instance, for an unbroken distance of twenty-six miles."

The following table will show what was done in ten years.

	Wells.	Ploughs.	Village Tanks.	Estimated population.	Revenue.
Total in 1835-36	2233	2712	—	39,648	9,680
Total in 1846-47	6148	9691	2065	100,282	21,022
Positive increase.....	3915	6979	2065	60,634	11,342
Ratio of past to present	1 to 2.753	1 to 3.753	—	1 to 2.529	1 to 2.171

This improvement is in a country unsuited by population, and by its general contours, and unfavourable in its rain-fall; thus he sums up: "The development of a great system of irrigation works (by which the fallen rain is economised to the utmost, and distributed in time and place of need, instead

of sweeping down the valleys and passing away in a useless torrent) has been the means of giving permanence and advancement to the improvement in the character and habits of the people."

"By these works the country has been *fortified against the miseries of famine;* tracts of wild jungle have been converted into fruitful fields, dotted with villages and alive with rural industry ; population and revenue have more than doubled; families, which for generations had abandoned their native hills, have returned to seek their traditional landmarks," etc.

The same effect was produced in Ajmeer under the same management. Thus by a well-digested system of tanks, and with a comparatively small outlay (total outlay between 1835 to 1846 of about £24,000 ; Captain Baird Smith's "Italian Irrigation," appendix, p. 423) a barren and thinly inhabited country can be raised to a populous and prosperous province. It is very instructive, and there is no portion of India that could not be

treated in the same way, without launching out into great expense for vast irrigation works. Such works are doubtless wanted, but *festina lente*, let us secure the well-being and safety of the people of India from famine; let us raise India from her financial difficulties, and take her out of her present false position as regards opium and the heavy tax on salt, before we seek the *éclat* of immense imperial schemes.

Let us now turn to the great irrigation works of Madras, and shortly show what has been their result.

PRINCIPAL IRRIGATION WORKS.

	Cost		Return		per cent.
Tanjore ...	400,000	...	290,000	...	72
Ristnah ...	350,000	...	300,000	...	86
Godavery .	550,000	...	280,000	...	51

The increase in the chief irrigated districts has been:

EXTENSIVELY IRRIGATED DISTRICTS.

	1844.		1870.
South Arcot	247,000	...	435,000
Tredimopoly	150,000	...	204,000
Tinnevelly	266,000	...	444,000

LESS IRRIGATED DISTRICTS.

	1844.		1870.
Salem	198,000	...	286,000
Chingleput.....	320,000	...	436,000
North Arcot	249,000	...	303,000
Conubatore	251,000	...	317,000
Bellary ..... Cuddapah ..... Rurnool	638,000	...	765,000
Madura	234,000	...	346,000
	1,890,000		2,453,000
			1,890,000
		Increase.....	563,000

30 per cent. increase.

Let us now turn to Bengal:

	Cost		Return		per cent.
Ganges Canal	2,300,000	...	257,000	...	11
Barie	1,200,000	...	80,000	...	6½
West Jumna	260,000	...	120,000	...	46
East „	180,000	...	66,000	...	37

An average of 25 per cent.

The curious fact is that this great success of irrigation is not denied; but still railway extension, to the extent of 100,000,000, is insisted on—although the present extended system has been a loss of 3,000,000 a year

(which is increasing), and it is now twenty-seven years since it was commenced; still there is the old hankering after railways.

I have no doubt whatever that all modern improvements may and will find a place in India, but let us duly consider the peculiar wants and physical features of the country, before we rush wildly and expend 100,000,000 in railways.

I have tried to draw attention to the physical conditions of the land and her produce, and the manners and customs of the natives; it is our wisdom and duty to study these, and I have given some instances of the vast improvements attainable by water. Let us then spend this 100,000,000, not rashly in railways or in canals; but beginning at the right end, studiously develope the resources of India for the Indians. Let us store water, let us make canals, let us establish iron works, let us utilise her mighty water power. Is it not a reproach to England, that with the very best coal and iron teeming over the land, above 30,000,000 has been expended in Eng-

land on iron for Indian railways, and "that the cost of inland carriage was so great, that iron cost cent. per cent. when landed on the ground," that is, indeed, developing the resources of a country with a vengeance, or *picking the country's pocket.*

Let us now consider the balance between railways and canals as far as we have gone.

Ninety-three millions, let us say, have been expended on railways, AND THESE HAVE ADDED £3,000,000 YEARLY TO THE TAXATION OF THE COUNTRY AND A LOSS OF 6,000,000 OF INHABITANTS. If we take the seven great irrigation works of India, viz.:—Tanjore, Kistnah, Godavery, Ganges Canal, Barie Canal, West Jumna Canal, East Jumna Canal, total cost £5,240,000; we find the return is £1,393,000, or on the average, about 44 per cent. profit. What would that £93,000,000 not have done for India, had it only been expended in accordance with the natural demands of the country?

The cost of storing water of course varies much; Mr. A. Wilson, C.E., in a paper read

before the Institution of Civil Engineers, states it as his opinion, that 3,500 cubic yards would cost £1. Col. Dickens, in 1855, estimated the cost, from four tanks, at 4000 cubic yards for £1. It has been estimated as low as 9000 cubic yards for £1, or even very much lower. I would, however, considering the length of time since these calculations were made, and the increase in cost of all constructions, take it at 3000 cubic yards for £1. Thus £93,000,000 would have given us 279,000,000,000 of cubic yards of water stored. This would have given sufficient water to irrigate about 70,000,000 of acres, allowing 4000* cubic yards of water to an acre; or, taking the cost of a canal at £6000 a mile, we should have had more than 15,000 miles of canal.

I have estimated the cost of canal very high, as I would allow for ample storage. The Ganges canal cost less than £2,500 a mile, part of the main Soane canal is estimated

* Common grains require 1500, rice 3500, sugar cane 7000.

at £4000 per mile, and the Damooda canal is estimated at £2,500 a mile.

Some of this vast sum of £100,000,000 would also have been far better employed, as before observed, in developing the coal fields of India. Instead of £273,024 being expended for English fuel (see "Blue Book," c643, page 32), against £97,293, the cost of Indian fuel, the cost of English fuel should cease to figure in the accounts.

There are forty-four coal fields in India, and many more will be found; of these forty-four, nineteen are reported as being worked, yielding an outlay of 10,000 each yearly, or 190,000 tons in all, during the year 1871.

All the railways in India carried 284,524 tons only of coal and coke. For 5,300 miles of railway, there were about 14,000,000 train miles run, and the total cost of fuel was £421,251—£273,024 being for English coal, £97,293 for Indian coal, and £50,000 for wood. This would give about 7d. a mile, per train, for fuel, and would probably represent about 400,000 tons of coal.

The out-turn, as above mentioned, from nineteen coal mines, was about 200,000 tons (yearly increasing),* or half the quantity, as shown, as necessary for our railways alone. We have to provide for workshops, various manufactories, steamers, etc. There should not be the slightest difficulty in procuring coal for all purposes, if Government would use half the zeal it has in burdening India with railways.

But here again our sins find us out; for to employ the vast supplies of coal to be found in India for our sea-going steamers, water-carriage will be indispensable. The proposed canal from the Weingunga to the east and west coast would tap the Chonda coal fields, and those on the banks of the Godavery. It would bring down coal to Bombay by the Taptee valley, to which the Nerbudda navigation might be easily joined, by coast canal. A system of inclines for downward traffic might enable hide-made boats to pass

* At the present time the out-turn would probably be nearly 400,000 tons.

rapidly down, to be taken to pieces and sent back by railway.

From all accounts it does not seem that a right understanding has been arrived at of the vast coal fields of Central India.

I believe this coal field to extend from the Nerbudda (and perhaps north of that in thin beds) to the south of the Godavery, and it will be found to stretch, I think, nearly to Hyderabad in the Deccan.

On the west, this coal field has been broken through and destroyed by the Western Ghauts, or it may be, that it never extended further. To the south-west, it will extend as far as Beeder, where the vast basaltic overlaying sheet ends—and beyond that, the coal has suffered from denudation. To the east the coal beds will extend as far as Nagpoor, and beyond nearly to Bundara; to the south-east, nearly to the Kistnah.

This vast field has been preserved greatly by the out-pouring of basalt. At the same time it has been destroyed at the centres of eruption — as at Oomrawuttee and Lonar,

south-east of Makur, in West Berar, and probably at Makur itself; also the upheaval of the Satpoora or Chickuldah hills have seriously disrupted it; also the hills south of the Poorna valley, and the upheaval near Ellora and Ajuntah.

The desideratum NOW is the discovery of coal in the south. I can give a clue to it. I think on the low hill on which Tanjore is built, there will be found sandstone of the carboniferous period, underlying laterite; this should be traced to the north bank of the Coleroon river, north of the Woodiarpollium jungles. Again, where did the sandstone seen in the temples on the island of Seringham, at Trichinopoly, come from? it came from the north bank of the Cauvery River in a north-west direction between Salem and the Cauvery, south of Sankerry Droog.

The whole of this country north of the Cauvery has been much broken up by the upheaval of the Sherraroys, Putchamully, and Culleramully hills. The most favourable places for boring operations are those men-

tioned above, and the Ahtoor valley to the east of Salem. The discovery of coal in this last locality would open up a vast field of wealth, as there are immense mines of the richest iron* ore near Ahtoor.

In the neighbourhood of Tengericotta also, above the Moroor Ghaut, when surveying for the Madras railway, I found the prismatic compass utterly useless. There are probably vast beds of iron ore in the neighbourhood. This circumstance would seem to point out a means of discovering large beds of iron ores.

As far back as 1854, I forwarded a paper to the Madras Government, and recommended a search for coal, and brought prominently forward the great importance of establishing iron works. Government refuse to spend the moderate sums that would ensure the formation of iron works, yet in eleven years they expend £93,000,000, of which nearly £30,000,000 have been expended in England, chiefly for iron; had that amount been ex-

* Vast beds of magnetic oxide and peroxide of iron.

pended in India, we should not now find ourselves with such a heavy burden to meet annually: that sum would have enriched the natives, opened up the mines, and the ways of transit; it would have permanently and materially improved the country; we should now be paying half the present price for iron, and probably one-third the present price for coal. But no! it could not be,—a vast sum must be invested for English pockets, and £30,000,000 paid to British merchants.

The loss from an insufficiency of practically trained men in India has been vast. I have before remarked, that in May, 1854, I forwarded a report to government on fuel, and recommended a search for coal: but nothing was undertaken. In October, 1863, I wrote to the government of India, proposing the establishment of iron works, foreseeing that there must be an enormous demand for iron.

The officiating secretary (a military engineer) wrote in reply, in letter No. 5259 D. 17th Dec. 1863.

"The Government of India will view with

satisfaction any steps that may be taken for the introduction of the manufacture of iron into India, and would treat in a liberal manner," etc. . . . . 3. "Under the present *condition of India*, it is held to be needless for the government to undertake any *special* investigation into the capabilities of the country for the production of iron, the manufacture will always be one of much difficulty and require a very large investment of capital, and the prospects of a general prosecution of such a branch of industry in the country very remote." In January, 1863, however, Major Keatinge had been permitted to visit Sweden, and secured the services of Mr. Mitander to superintend the works of Burwye. Why in the name of all that is wonderful go to Sweden? It was a failure. The furnace got gobbed or choked; yet the *remedy was simple*, the same difficulty *had years* before *been experienced* and had been *overcome* at Porto Novo, south of Madras, without the assistance of a Swede.

Government need not have failed, nor need

they have sent all the way to Sweden for a man; but I would remark on the concluding words, "and the *prospect of a general prosecution of such a branch of industry in the country very remote.*" Could any thing, I ask, be more short sighted, could any thing be more painful, or exhibit in stronger light the total disregard to the development of the resources of the country: from about that year 1860 to the year 1871, 30,000,000 of pounds sterling were expended on iron in England for Indian railways. Nothing, I maintain, but the greatest indifference to the general welfare of the country, could have prevented a man with the most ordinary understanding from grasping the fact, that the construction of railways then commenced must cause an unlimited demand for iron, and if that demand could have been met in India, the stimulus to the development of the country would have been immense, and also the cost of the railways would have been considerably lessened.

The development of iron manufacture in

India would have revolutionised the country. We have no difficulties in our way now, the discovery of coal in large quantities, and Bessemer's process, would enable us in a few years to turn out all the iron we wanted.

A portion of the £100,000,000 could not be put to a better purpose.

PART III.

OUR PRESENT CONDITION.

OUR SECRETARY OF STATE.

"A hundred men's affairs confound
My senses, and besiege me round."

OUR REMEDY.

"To the Empress of India then, as the *parens patriæ*, bound to maintain the people's rights, I now appeal—for

A FEDERAL COUNCIL."

PART III.

KNOWING as I do the capabilities of India;—knowing as I do the cleverness of her work-people, her smiths, her masons, and her carpenters;—knowing as I do their tractability and willingness to be taught, no greater crime can I conceive, than we have committed in neglecting to develop Indian resources. To have developed her resources, would have given a practical training to the education of her youth. We have offered them education, but by no means have we held out equal hopes of employment; the one without the other is a farce, nay! we shall live to learn that it is a highly dangerous experiment. Learning and talent will find their vent; let us furnish a genuine one, lest it find for itself one less to our liking.

Consider the nature of the country in its length and breadth, with its vast arid plains, as in Hyderabad, and some parts of Central India, covered by loose stones, the *débris* of decomposed nodular basalt, as rich a soil as can be found, or of decomposed gneiss or granite, now bare of vegetation and sterile for want of water.

Look at the vast plains covered with florican grass, the resort of hyenas and wild boars, south of Jalnah : look again on the vast cotton soil plains of Berar, a black dreary waste in the hot weather ; in the cold weather a mass of cultivation covered with cotton, or jowaree eight feet high, and see what water can do.

Again, the laterite plains of Raipoor, where you can galop for miles on a hard level without a bush, are all capable of cultivation by water.

Let me lead you through the wild and vast forests of the Terai, or Goomsur, or the Wynaud. Let me point out to you the wonderful tanks now in ruins, lying amidst the

pestiferous jungles of Orissa, where formerly happy villages flourished, and a long bygone race have dimly left their footprints. I can truly say there is no place on India's surface where the want of the engineer is not manifest, or where his skill is not required: here, in draining unhealthy jheels or swamps, or cutting broad roads through unhealthy jungles, infested by wild animals; or there, in storing water. Either the common practicable road is wanting, or the plains are dried for want of water that inundates them in the rains, or there are swamps that might be turned into fruitful cornfields.

For India and her ryots, in *connection with the peculiar features* of the country, we have done *but little*. We have not considered our subjects in connection with their own country, but only as regards their connection with us.

Here it is that we have made so grand a mistake. The railways and the expenditure of £93,000,000 might have been an excellent thing for the natives, had they lived in a country like England; but what they wanted

was, first, sure and certain food, then manufactories, then transit. While we have been building these railways, let us never forget that 6,000,000 AT LEAST HAVE DIED OF FAMINE, for want of that water which it should have been our first object to have stored.

Deeply are we guilty, deeply are we responsible for this! Would that I could bring it home before the minds of our rulers in letters of flame.

I repeat, we have given no thought to the natives in conjunction with their country! It suited England; it suited English engineers; it suited English merchants; it suited the English people to pour her sons into India on high pay, to saddle her with £93,000,000, FOR THAT WHICH HER PEOPLE DO NOT APPRECIATE, WHILE HER PEOPLE DIE CALLING FOR WATER. Had England done her duty, we might, perhaps, have been spared the Indian mutiny. How many hundreds of thousands of hands might her iron and other mines have employed? How is it that England, with her wise and honourable counsellors, men far

above peculation, and generally earnest to do their duty, have fallen into this lamentable error, this disastrous error, as regards India and HER SONS ?

It is, I honestly believe, because proud by nature and self-reliant, thinking beyond measure of our own knowledge and our own experience, we are, as islanders and also as birds of passage, hard to be impressed by the wants or peculiarities of others; because our pride forbids us to take counsel, and we have not sufficiently studied the country, and the natives of the country.

A man goes there for a few years, falls into his groove, and never thinks of a native but as one to be ruled and *taxed*. One other point must not be lost sight of. *Our engineers*, bred and born in England, have had generally little or nothing to do with irrigation. No engineer, it may be honestly said, has had experience of irrigation or canal works on the scale that we require for India.

Then we have to train men to comprehend and grasp the immensity and the gigantic

proportions of this work. Has not this very want of *practical* knowledge in the most essential branch of engineering for India been the cause that so little has been done? Has not the more familiar knowledge of our engineers with *railway practice* been the cause that railways have been made? Nay, has it not been the VERY ORIGIN of the supposed SUPERIORITY OF RAILWAYS over WATER COMMUNICATION?

Yet, I venture to say, that no real thinking man, calmly considering what has been here remarked, and taking a comprehensive view of the wants of India, can for a moment doubt that water is the one want of India. That the storage of millions of cubic yards are necessary, and works on a scale hitherto never thought of, have to be undertaken, if we wish to make India what she should be.

The description of work necessary, can be seen in the vast Veraunum tank still in existence, which is thirty-five miles in area, and whose bund is twelve miles in length. We have to do far mightier works; we have

to utilise the vast valleys running into the Western Ghauts and the Himalaya range, where we can at once obtain the heaviest rain-fall, and the formation of the deepest reservoirs, and whence the land can best be dominated. Such bunds, however, will require to be Cyclopean in their dimensions.

There should be, however, no insurmountable difficulty. The old native engineer was led probably entirely by eye in the selection of a site; in the formation of the embankment he was guided entirely by rule of thumb, and he certainly had no clear conception of calculating for his waste or surplus weirs, as the destruction of so many tanks from their insufficiency testify; we can bring much scientific knowledge to bear upon the question.

The native works in the Cauvery River were annicuts, or rough banks or walls across the river, and were used solely for irrigation; likewise the works on the Toongabudra river testify that irrigation was the sole object. Yet the general slope of the country, from the west to the east, would seem to point out

the adaptability of canals as a means of transit. It would appear possible to utilise the motive power derivable from heavy weights descending inclined planes for irrigation, well paved, for the haulage of goods in a contrary direction.

The outlet of these rivers, however, into the Bay of Bengal, where it may be said there is no first-rate or even second-rate harbour, and is, moreover, subject annually to most destructive hurricanes, is a matter that requires much consideration. It would seem to point to the advisability of considering, whether after the completion of a steamboat canal between the Godavery and the Taptee to Surat or Bombay, a junction could not be made between the Toongabudra and the Godavery, starting above Humpee, west of Bellary, and crossing the Hyderabad country, join the Godavery, and thence by the Wurda and the Poorna valley reach Bombay. The construction of a harbour westward of the Paumbem channel, as suggested by Sir A. Cotton, in connection with the coast canal,

is of great importance. In 1854, I submitted a plan for a breakwater at Madras, with Potts' piles and artificial blocks of stone, the system of which I see no reason to alter.

The mouths of all the large rivers that debouch into the Bay of Bengal afford little or no shelter for shipping. It might, however, be found possible to form a system of floating docks at the mouths of some of them.

The subject, however, of tidal engineering is one requiring much and patient investigation. There should at once be set on foot careful surveys of the mouths of all our large rivers, and the sand or mud banks should be carefully mapped, the alterations in these, and the set of any currents, etc., carefully noted at stated intervals. Without this, no remedy can be recommended for the silting up of bays or the deepening of bars. At any rate, the works necessary for regulating the banks, etc., at the mouths of our large rivers must be an extremely expensive undertaking. They may, however, become absolutely necessary with increased traffic, and without a long

course of carefully made observations we are working entirely in the dark. You cannot force water, but you can entice water to do the work you want.

The object of developing the resources of the country cannot be found in any panacea. Each province must be dealt with according to its physical and natural features.

Under the Himalaya range, it has been before mentioned that there are vast areas that can be converted into reservoirs, and many sites found, where water-power could be advantageously used. It would be a question to be considered, whether a country should raise raw produce, or should employ its inhabitants in manufactures—or a combination of both; this point will have to be decided by the nature of the country and the tendencies of the inhabitants; and the decision must necessarily affect the nature of the engineering works required. There are mines of coal, iron, copper, etc., etc., to be worked, and manufactories of iron, in its various branches, and of cloth, ropes, leather, to be established.

Some manufactures we may at once lay aside as unsuited to the climate and the wants of the people; such as wine, beer, artificial manures; and any works requiring very complicated machinery are not likely to come into general use. But saw-mills and flour-mills in certain localities, iron in its various forms, and the working of metals from their raw state; the better and more extensive system of expressing vegetable oils, and the manufacture of very fine descriptions of cotton and flax goods would succeed. The flax plant grows smaller in India than in Ireland, but the Indian fibre would, I imagine, be far finer if properly manipulated — flax, however, is generally grown for the seed only in India; but there is no reason why it should not be used for the manufacture of linen, as the climate would greatly assist the process of steeping.

I wish to point out in these remarks, that we should consider more closely the wants and proclivities of the natives and the physical nature of the land, rather than launch into vast imperial schemes, that have closer con-

nection with the employment of the huge Public Works Department than the good of the country.

I have shown what railways have done for us, and for India. I have shown what water did for India as far as it was carried out ; and what might have been done, had the same money been used for irrigation, that had been expended on railways.

I would not, however, insist on canals only nor on railways. I would simply and earnestly entreat our rulers to cast a comprehensive view over India and her wants, as I have honestly attempted to portray them, both as regards her physical features, and the commercial and industrial wants of her people. Let us put away the temptation of enriching England, by spending £30,000,000 in buying her iron. Let us cease to force upon the country crowds of highly paid European engineers, where native engineers might be earning an honest livelihood in developing the resources of their native land.

Government, I am afraid, is somewhat like

Professor Holloway: it has but one panacea for all ills—Railways! and only looks to one interest, the interest of the shop.

The difficulty is not, however, so much the understanding of the figures, that can be shown, as the results of the railway, or of canals. It is the difficulty of stopping a huge and gigantic system of patronage, that has now enveloped India in her folds, and will, if it bring not destruction upon us, at all events *bring disgrace.*

Look at Cooper's Hill, perpetuating a system, that has so singularly failed and has cost Government so much treasure. Year by year and day by day, we are hurrying young Englishmen out to learn and practise their unskilled brains at the expense of India. Look at any list of P. W. officers, how many native names do you see among them? yet I say, and no one that knows the natives can deny it, that there are thousands of brains and hands that could do equally well, if not better than the European; and certainly far better, if the nature of the climate is taken

into consideration. This patronage we have to break through; we have to establish a system that shall give free vent to native talents, and bring it on a fair platform with our own—there's the rub!

A high class of intellectual training of pure theory, does not produce great men; men are required for India of varied experience and of ready resource: but not only is Cooper's Hill unsuited for its purpose in its mode of training —it is unsuited by its expense and exclusiveness for the wants of India. The basis of any engineering college for India, should be, and must be, that it is perfectly and easily accessible to the native, and no college can be that which is in England.

As a finishing college (but not compulsory) of engineering, where the Indian student might finish his education by studying European engineering works, and take the highest degree in his profession, it might be tolerated; but as a training school for Indian engineers, whether European or native, it is simply a disgraceful imposition on India.

The question of our frontier is again about to become an important one; do not let us be led away by an idea. Our diplomacy with Affghanistan has well been termed "masterly inactivity"—Affghans are not to be trusted.

Our diplomacy with the Affghan will not frighten the Russian or prevent his advance: he will only count on finding so many rupees and so many useful stands of arms ready for him at Cabul. They, the Russians, send their Grand Duke with plenary powers to the front and quietly forge their way onward.

We know absolutely nothing of their real movements. We might advantageously send OUR GRAND DUKE to the front, with the view of learning a lesson in active diplomacy, especially at this *auspicious moment.* We are in a very unsatisfactory position, both as regards our physical frontier and our finances. Our finances are on an extremely bad basis, EVEN SIR RICHARD TEMPLE cannot cast a *roseate hue* over their present condition. A panic, a failure of the opium crop, and we should find it difficult to re-establish con-

fidence. With Russia boldly creeping on towards our boundary, we may at any moment be called upon to make an immense outlay in securing our frontier. At present we have no frontier; a part of the £100,000,000 will be well employed in securing one, by occupying the mountain ranges and the difficult passes in our front, whence we can look down in peace, and keep the Affghan in check, or help him at his need.

In connection with the subject of our frontier, and, as a soldier, I must here remark, that we have altogether mistaken our position as regards the military population of India. The Shikh, the old Mahomedan families that supplied regiments of irregular horse, the Rajpoor and Rhators, are all men trained to arms from their youth—men of war whose forefathers were soldiers from generation to generation, and would, if fairly treated *as soldiers*, and with fair opportunities of advancement in rank, honours, and emoluments, have always been found faithful to their salt. Men like Chamberlain, Nicholson, etc., know how

to lead and rule such men, but, generally speaking, they have been wretchedly treated. We have sacrificed everything to gain. To fill the pockets of English merchants we have neglected, not only the *vast resources* of India, but her INTELLECT and her BRAVERY.

Under proper treatment, there are no races under the sun that could vie with these troopers of India for endurance and courage, for swordsmanship and discipline, for sobriety and horsemanship. Traits like these, once obliterated, cannot be reformed; the result of ages, once neglected, is lost for ever. We should do well to nourish these fine old soldier families, that have, for the last fifty years, through our purely *mercantile treatment* of India, been entirely neglected. It can never answer to allow the whole chivalry of a nation to die out. There is something besides the *£. s. d.*

The time is coming when we may require these men. Here, again, some part of the £100,000,000 would do us real service.

We have still the old hankering after rail-

ways, and are about to add immensely to our expenditure in that unprofitable line. Let us take breath before we rush headlong into inextricable difficulties—*facilis descensus Averni.* We shall not help ourselves, railways will not help us, nor any amount of armed men, in the day of trouble, unless we carry the hearts of the people along with us.

Irrigation works may not possess that *prestige*, nor produce that *éclat*, that belong to railways. It may require some power of mind to stem the popular idea of railway infallibility. Surely ONE INFALLIBILITY is sufficient *in a century.* Irrigation works will be found quite as capable as railways, and far more profitable in giving work to that unwieldy Public Works Department. Irrigation also opens the only door for putting our finances on a *real solid foundation*, by removing the necessity of trusting to opium, and increasing our revenue by the most legitimate tax in India, and one capable of the greatest increase.

The custom and traditions of the country

point to the land revenue as the tax which should be extended. It is capable of vast increase, but our mode of procedure has in this, as in many other instances, been *in direct variance* with our best interests. Here again, *water is what was required.* I have pointed out that in Mairwara, out of 1,200,000 acres in a rugged and wild country, £24,000 outlay increased the revenue by £11,000, from 15,000 acres of wet land. The land revenue of India is about £21,000,000 for about 220 millions under cultivation, or one rupee per acre.

Under English rule, there are 516 millions of cultivatable acres, and there are at least 30 millions of acres capable of being brought under wet cultivation. There are many thousands of places where, by the repairs of old tanks, and extension of the old systems* of irrigation, the area might be increased at a cost of from 5 or 10 shillings an acre. The whole might be done at an average of

* A map showing all the tanks of India, with an historical and statistical account, would be a *desideratum.*

one pound sterling per acre, or for 30 millions of pounds, that would be all repaid in 2½ years after expenditure, with an increase to the permanent revenue of the country of at least £20,000,000. It would not be necessary that this sum should be expended wholly on gigantic Imperial works. It would be far better at first to study and put in order old ruined tanks, and improve and extend their irrigation where possible.

Near Hirrial, in Mysore, a site for an immense tank was pointed out by Sir A. Cotton, in a part of the country where irrigation would be a boon. On the bank of the Weingunga, towards and south of Sohnepore, there are vast numbers of old tanks, some of immense extent, all in ruins (alas! over the length and breadth of India, there are 30,000 tanks that require repairs). The expenditure could be advantageously spread over a very large area. In many instances, the outlay required would be slight, the progress would be rapid, and the return proportionally quick.

To conclude: I have tried to show how the physical aspects of India, and her history, point out that her first great need is water, that that need is paramount and cannot be delayed. Let us put irrigation now in the place that railways have held, and for the next twenty years spend £80,000,000 in canals and irrigation, and £20,000,000 on railways. We have worked twenty years for our own profit; let us now give the natives a turn, and we shall find that their profit is also ours. We have been too eager to show improvements, however unsuited to the country. It is natural that the Government should wish to reap credit for progress, but surely it is the duty and the very test of a good government, to withstand all pressure brought to bear on it by interested agents, and to seek deliberately only what is the best for the country.

I believe that the PRESENT is a *great crisis* for India, and I trust that my remarks may cause some consideration before £100,000,000 are expended on railways. It is not of so much

consequence on what it is expended, as long as it is expended on the true advancement of India. I have attempted to show that hitherto the advancement of India does not seem to have been our object so much as our own aggrandisement. I have attempted to point out the various and the immense fields for improvement that exist in India, and if I could see some honest attempt made to develop the resources of that country, where I spent the best part of my life, my object would be gained. I would once more repeat, that it is our best and only path of safety. No standing army, no railways, will save us, unless we possess the affection and CONFIDENCE of the people of India.

That confidence you cannot gain by expending the wealth of THEIR COUNTRY, by English ministers, for European purposes; nor allowing THEIR RESOURCES to lie idle, while you use *your own;* nor by governing and administering the weighty affairs of India without the aid of THEIR BRAINS.

It is an unpleasant task to find fault, and one

that brings no credit; in the task, however, that I assigned myself, I have dealt with measures not men.

Above the murky and boisterous atmosphere of traffic and merchandise that has surrounded our Indian Empire, the bright and righteous light of many noble and pure spirits shines out conspicuously. Looking back along a long list of celebrated names, none shine out more dictinctly or more purely than the names of Sir Henry Lawrence and Sir A. Cotton. None have shown greater singleness of heart, and purity of motive. The one will live for ages in the hearts of the children in the Lawrence Asylum; the other, in the hearts of the ryot, for his magnificent irrigation works. In the long list of the servants of our Indian Empire, there are many names known to fame in war, in council, in arts. No service perhaps in the world can boast of men so honest, so self-sacrificing, or so earnest in their duties; yet with all this we have failed because, I believe there is no assembly where the policy

of India may be publicly discussed, be elaborated, or be exhaustively examined—because there is NO PUBLICLY RESPONSIBLE SOURCE to which the public can look for a decided expression of policy.

In remarks on a paper read by Major Evans Bell, before the East Indian Association, the chairman, Sir Charles Dilke, observed 13th July, 1870: "Mr. Gladstone, in his speech in answer to Sir Wilfred Lawson, laid down a doctrine which, if not contradicted, puts an end at once to all practical good that can be done by such an association as this, because, what he told the House of Commons was, that the revenues of India were something entirely beyond its scope". Where then are we to look for an assembly that can define our policy?

The formation of a federal council in India seems the only method of getting rid of our vague and uncertain policy towards that country. I would draw attention to certain facts that prove the uncertainty and haphazard origin of that policy on some funda-

mental points. For instance, whence did the policy of annexation spring? Avowedly from Lord Dalhousie, the Viceroy for India. Whence did the Education Bill emanate? From the old court of Directors by despatch of 1854.—Whence did the huge and expensive system of railways for India emanate? Avowedly from Manchester.—Whence did our system of finance spring?—*If system we may be said to have!* — Echo answers, WHENCE!!—We must give credit to Sir R. Temple, HE did not inaugurate that dangerous state of things. It would seem that money was wanted, and the first and most prominent thing was grasped at (opium) to raise money upon, without any due regard to the policy of the act. Again, the present mania for railway extension, emanates from that vast, expensive, and cumbersome Royal Engineer Public Works Department. Work had to be found for that unwieldy and irresponsible body, and most unfortunately for India, it happens that that body, from the very nature of its especial and exclusive training,

could not divest itself of the old idea, or regard the matter as one in which the people of India and the peculiarities of the country should be consulted *versus* Manchester. Here is seen the want of a Federal Council, that could and would originate a policy as regards public works in India, that should benefit India alone, should STORE HER WATER, and use HER TALENT and HER MATERIAL, and inaugurate a Public Works Department, that should not be dominated over by a clique, but should be open to the whole engineering skill and knowledge of Great Britain, and in which, STRICTLY PLACED RESPONSIBILITY should weed out the idle and incompetent.

Thus, hitherto, we have staggered along the road, snatching at any policy that turned up; no one knowing whence the next new policy, mushroom like, might not appear, or where it might lead us. Up to the present time our adopted waifs have led us to RAILWAY DEBT, INSECURE FINANCIAL POSITION and FAMINE. Some, perhaps, have been vaguely living in hopes that they might sometime

hear a clear exposition of our policy pronounced in Parliament; some, perhaps, even hoped that the Indian Council, like Balaam's ass,* might turn round and rebuke the Government or the Secretary of State, for their weak, or rather no policy, and take upon itself a defence of India, whose council it is, and shield her from her rapacious masters. Assuredly, as great a danger menaces us, as menaced Balaam, unless we listen to the voice of that great nation THAT NOW LIES AT OUR FEET WITHOUT A SINGLE PRINCE OF THE LAND HAVING A VOICE IN HER POLICY.

There are clever brains at work, and shrewd intellects acquiring knowledge; there is untold wealth in the land, and the old chivalry

* I mean no disrespect whatever to that august assembly of old meritorious officers of long approved talent. I am personally acquainted with some of them, and could not think of disparaging their acknowledged merits in any way. But is it not hard for the British Public, and still more *for the Indian Public*, that so much accumulated knowledge and experience should be *dumb?* that those well-trained brains should be only tapped by the Secretary of State for India? Query: Does he ever tap them?

of the land is not dead, however dead it may appear. Intellect, talent, and power, will find their vent; these elements are daily gaining strength; let us be wise in time, and give them legitimate scope, lest, having sown the wind, we reap the whirlwind. However wise our counsels may be, however much knowledge we may bring to bear upon Government; unless we allow the princes of the land to have a voice in all matters of policy connected with their own country, we cannot hope to have these questions thoroughly and properly argued, nor our policy uncontaminated by foreign and selfish considerations. Questions having reference to the development of Indian resources; the defence of the N.W. frontier; the formation of a highway to India through the Euphrates valley, etc., etc., should receive consideration by the most practical and advanced minds of our times. Such questions must be delegated to a properly constituted public body, to a more extended area of discussion, where the most practical minds might bring their

experience to bear, and where the native element should be largely introduced.

Surely, in these times of free discussion and of open competition, it is unendurable that the future of our greatest and mightiest empire on its most vital points, should hang on a hap-hazard policy, and only by good luck, get a few hours of midnight discussion by a drowsy set of Englishmen, who care nought about the country, and that that discussion is all that these mighty questions meet with as far as the public is cognizant. These questions, I maintain most strenuously, must receive consideration, not only from an European point of view, but *chiefly* FROM AN ASIATIC POINT OF VIEW :—and for this reason, the best men, and the cleverest men in our eastern empire, should have a voice.

There are many wise and enlightened chiefs who would be able and willing to give us aid. Without much disturbing the present order of things, I would suggest an Indian Federal Council in India, composed of the Viceroy, native princes of certain rank,

governors and lieutenant-governors, chief commissioners, and commanders-in-chief, etc., etc. As far as the public are concerned, and judging by the records of the past, India would not lose much by confining the Indian COUNCIL IN LONDON to simple routine matters, and to such only as England and India must have joint interest in IN ENGLAND. Such a Federal Council as I have suggested, might meet at Jubbulpoor, or on the Chickuldah hills, easily accessible from all parts.

Australia, New Zealand, the Cape of Good Hope, etc., etc., have all their Federal Parliaments. India, with her powerful princes, her civilisation, her many peculiarities, imperatively demands one. India, with her varied nations, and races, and castes, demands far more definite knowledge, and far closer consideration than can be given to her in Parliament, or by a Secretary of State in England.

APPENDIX.

SUGGESTIVE.

I.

HAS not the time arrived for a Royal Viceroyship of India? Might not the Royal Duke of Edinburgh, with his Russian Bride, shake hands with Russia across the borders of India? Could not England and Russia in concert agree to civilise and ameliorate the condition of the Affghan and Persian, without drawing the sword upon one another? Could they not, both united, find a sufficiently broad field for their energies and development in the wilds of Central Asia, instead of complicating the affairs of Europe by interfering with Turkey?

Would not such a Viceroy fully accomplish all that is now required in India, and fitly

inaugurate a system of direct and patriotic government? under no better chief could the native princes be marshalled and educated to direct the policy of their own country. Such an event might also tend to promote a speedy solution of the question of direct communication between India and Europe, by an overland route. Such an event might bring British and Russian officers into personal contact, a circumstance much to be desired. Instead of always looking upon each other's motives and movements as hostile, they might find a common cause and object for friendly unity.

If such can be, if such should be, the fair face that so lately blessed our shores will be the cause of bestowing as great a blessing on the human race as has ever fallen to the lot of princess to bestow.

APPENDIX.

THE PUBLIC WORKS DEPARTMENT.

II.

I DO not think we are acting at all fairly to India in supplying her wants entirely by young untrained men, and excluding the most skilled and ablest brains of Europe.

I would suggest that the Public Works Department be thrown open to the public; that engineers educated and trained in England should be employed in India; that such men should be employed directly for certain works by the Council in India. That would give you direct responsibility. Such men would take a certain number of pupils, who might be obliged to pass through Cooper's Hill for the highest honours.

Such a course would make the department much more elastic, and would enable it to be greatly reduced at once and effectually in time of want, and it could be extended to any degree in time of activity with men well trained and up to their work; and more than all, men who would rest entirely on their own responsibility.

The employment of such men would afford the natives of India (if initiatory engineer schools were established) an opportunity of apprenticing their sons to engineers of high professional character in their own land, and at the same time it would remove a system that is at variance with all the instincts and requirements of the age.

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